



B. Tech. Degree V Semester Supplementary Examination in Marine Engineering December 2015

MRE 507 NAVAL ARCHITECTURE I

Time: 3 Hours

Maximum Marks: 100

(5 × 20 = 100)

- I. (a) Name any five ship classification societies and their countries of origin. What is the role of a classification society in shipbuilding? Explain periodical survey as per statutory regulations. (10)

- (b) Describe the design features of crude oil carriers and chemical carriers. (10)

OR

- II. (a) Describe the offshore supply/support activities and the vessels used for them. (10)

- (b) Explain any five commercial vessel types and their design features. (10)

- III. (a) A ship has the following main dimensions and other data: LBP = 131 m, Beam = 17.4 m, Draft = 7.7 m, Displacement = 13500 t, load water plane area = 1850 m², Midship section area = 125 m². Calculate C_B , C_p , C_M and C_w . (10)

- (b) A ship has a displacement of 5000 t in the light condition with its VCG 6 m above keel. Cargo of 1000 t, 200 t, 5000 t and 3000 t are loaded with their VCGs 0.95 m, 1.1 m, 5.5 m and 9.6 m above keel respectively. Find new displacement and the new VCG. Subsequently, the 3000 t cargo loaded earlier is unloaded. Find the resulting displacement and the new VCG. (10)

OR

- IV. (a) A ship of length 175 m has the following half ordinates in meters: (10)

station	0	1	2	3	4	5	6	7	8	9	10
$\frac{1}{2}y$	1.1	7.8	12.1	13.4	13.9	14	13.8	13.5	11.9	7.2	0

Calculate the moment of inertia of water plane about centerline.

- (b) A ship of length 190 m has the following sectional areas, A_s [m²]: (10)

station	0	1	2	3	4	5	6	7	8	9	10
A_s	5	118	233	291	303	304	304	302	283	171	0

Calculate the displacement and LCB.

- V. (a) Distinguish between angle of list and loll. Two vessels float with an angle. If one among them has a list and the other a loll, devise an experiment by which we can distinguish them. (10)

- (b) A catamaran is made from two watertight cylinders of 2 m diameter and 6 m length each, joined together. The centres are separately by 4 m. Water level is at the diameter of the cylinders. Calculate the transverse and longitudinal metacentric radius. (10)

OR

(P.T.O.)

- VI. (a) What is the purpose of an inclining experiment? Explain the procedure to achieve this. (10)
- (b) A ship 5000 t displacement has a rectangular double bottom tank 9 m wide and 12 m long, half full of sea water. Calculate the virtual reduction in metacentric height due to the free surface effect. Suggest a method to reduce this effect. (10)

- VII. (a) A ship 120 m long floats at drafts 5.5 m for'd and 5.8 m aft. If $MCT_{1cm} = 80 t - m$, TPC = 13 and LCF = 2.5 m forward of midship, calculate new drafts when cargo of 110 t is added 24 m aft of midships. (10)
- (b) Distinguish between frictional and residuary resistance. State the factors affecting them. A ship has a wetted surface area of 3000 m². Calculate the power required to overcome frictional resistance at 16 kn using Froude's formula ($n = 2.0, f = 0.4$). (10)

OR

- VIII. (a) A ship of 15000 t displacement has a water plane area of 1950 m². It moves from harbor water of density 1.005 t/m³ to sea water of density 1.025 t/m³. Calculate change in mean draft. (10)
- (b) Explain admiralty coefficient and fuel coefficient. What are their uses? A ship of 14000 t displacement has a fuel coefficient of 63000. Calculate the fuel consumption per day at 14.5 kn. (10)

- IX. (a) Define floodable length, permeability, factor of subdivision and criterion of service. (10)
- (b) A ship has the following data: LBP = 195 m, LCF = 3 m abaft midship, $MCT_{1m} = 33200 t - m$, TPC = 44 and even keel draft of 5.8 m. During voyage, 300 t of consumable is used up whose CG is at 85 m forward of midships. Find new drafts. (10)

OR

- X. (a) Comment on the stability while docking and grounding. What precautions are taken while docking? (10)
- (b) A ship is floating in salt water on an even keel at 6 metres draft. TPC is 20 t. A rectangular shaped compartment amidships is 20 metres long, 10 metres wide and 4 metres deep. The compartment contains cargo with permeability 25 per cent. Find the new draft if this compartment is bilged. (10)